



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Carl G. de Marcken
Serial No. : 09/431,365
Filed : November 1, 1999
Title : METHOD FOR GENERATING A DIVERSE SET OF TRAVEL OPTIONS

Art Unit : 2166
Examiner : Rachel L. Porter

MAIL STOP APPEAL BRIEF – PATENTS

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APPEAL BRIEF ON BEHALF OF CARL G. DEMARCKEN.

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(i.) Real Party In Interest

The real party in interest in the above application is ITA Software, Inc.

(ii.) Related Appeals and Interferences

The appellant is not aware of any appeals or interferences related to the above-identified patent application.

(iii.) Status of Claims

This is an appeal from the decision of the Primary Examiner in an Office Action dated July 15, 2005, finally rejecting claims 1-4, 6-8, 27-28 and 52-59 are pending, all of the claims of the above application. Claims 5, 9-26 and 29-51 were canceled. The claims have been twice rejected. Claims 1-4, 6-8, 27-28 and 52-59 are the subject of this appeal.

(iv.) Status of Amendments

All amendments have been entered. No Reply was filed in response to the final rejection. Appellant filed a Notice of Appeal herewith.

(v.) Summary of Claimed Subject Matter

Background

Computer travel planning systems usually produce a number of travel options that is much smaller than the total set that could possibly satisfy a traveler's request. For example, a CRS may respond to a round-trip query specified by a departure city and date and a return city and date with a set of 10 or so possible flight and fare combinations, even though there may be thousands of combinations of flights that satisfy the request. In many cases, resource limitations prevent a travel planning system from analyzing or generating more than a small set of travel options. Moreover, for air travel the system generally needs to query airlines about seat availability, which places practical limits on the number of options that may be considered. [Specification page 1, lines 4-24].

Appellant's Invention

If a travel planning system is limited in the number of options it can generate, it may be desirable that the travel planning system consider or generate a diverse set of travel options to maximize the chance of generating good options by enforcing diversity in the set of options generated. [Specification page 1, lines 25-30].

Claim 1

One aspect of Appellant's invention is set out in claim 1 as a travel planning system.
[Specification page 4, lines 1-4]

Inventive features of claim 1 include a requirements generator module to generate a set of diverse travel requirements, by establishing a plurality of travel requirement templates, and for each travel requirement template, defining a plurality of travel requirements corresponding to different values of the travel requirements. "Referring to FIG. 11, the process 362 to generate a prioritized list of travel requirements is shown. The list may be a fixed list, for example the list of ten requirements in the example above. Alternatively, the list may be generated taking into account the number of solutions required, the ordering function, and the large set of candidate travel options. For example, the list may be generated 362 by filling 392 in a set of template requirements. A sample set of templates for air travel is

1. no requirement.
2. all flights on <airline>
3. non-stop.
4. outbound departure in <morning or afternoon or evening>.
5. return departure in <morning or afternoon or evening>.
6. outbound departure date <date>.
7. return departure date <date>.
8. non-stop on <airline>.
9. outbound departure date <date1> and return departure date <date2>."

[Specification page 42, line 32 to page 43, line 18].

"The large candidate set of travel options may be analyzed 394 to find all parameters e.g., airlines found in any travel option, all departure dates for outbound and return, and all departure

parts-of-day (morning, afternoon, evening) for outbound and return. The ordered list of requirements is generated by filling [3]96 in for each template all airlines, dates and parts-of-day present in the options.” [Specification page 43, lines 19-25].

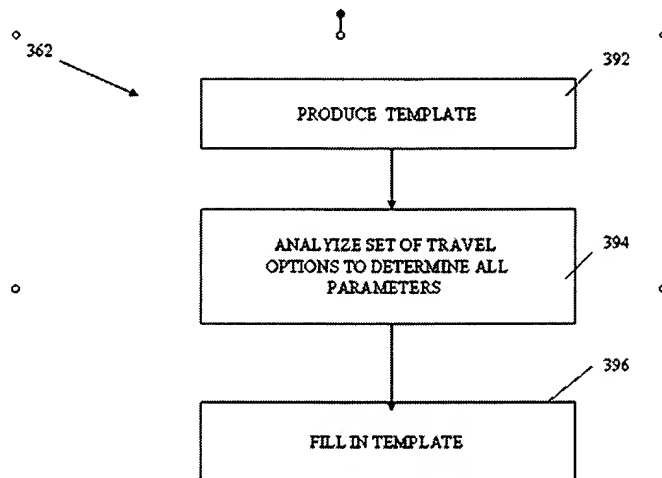


FIG. 11

Inventive features of claim 1 also include a selection module to output a set of diverse travel options. “The diversity process 350 selects 354 for each travel requirement the one or more travel options that satisfy the requirement preferably by choosing those travel options that best satisfy one or more travel preference functions that can be used to order travel options.” [Specification page 39, lines 6 to 10 excluding the text box on page 39].

This feature of claim 1 also has the number of travel options in the set of diverse travel options being fewer in number than the number of travel options in a candidate set of travel options. “Given set of travel options Ts 401, a set of preference functions Fs, and a desired number of answers for each preference function Ns, the alternative diversity process 400 returns a reduced set of diverse travel options Rts.” [Specification page 44, lines 15 to 18].

This feature of claim 1 also includes for each diverse travel requirement in the set of diverse travel requirements, selecting from the candidate set of travel options one or more travel options that satisfy that travel requirement with the candidate set of travel options represented using a data structure that compactly stores the candidate set of travel options. “If the set of travel options is represented by a data structure that stores a large set of travel options by

representing permitted combinations of smaller travel option components such as airline flights and fares. In such cases, the travel option selection process above is implemented using a more complicated operation than searching through an ordered list. With the pricing-graph the process for finding 370 the best travel option that satisfies a travel requirement is implemented for a representation that expresses travel options in terms of permitted combinations of smaller travel option components by disabling option components inconsistent with the requirement.”

[Specification page 41, line 24 to page 42, line 2].

Claim 52

Claim 52 claims another aspect of the invention. Claim 52 is a method for generating a diverse set of travel options.

Inventive features of claim 52 include determining a candidate set of travel options, the candidate set of travel options being based on user input and represented using a data structure that compactly stores the candidate set of travel options. “In one embodiment, the set of pricing solutions 38 is provided in a compact representation 38'. A preferred, compact representation 38' of the set of pricing solutions 38 is as a data structure comprising a plurality of nodes including itineraries and fares and that can be logically manipulated using value functions to enumerate a set of pricing solutions. One preferred example is a graph data structure type particularly a directed acyclic graph (DAG) that contains nodes that can be logically manipulated or combined to extract a plurality of pricing solutions. [Specification page 7, line 26 to page 8, line 4].

Claim 52 also includes the feature of defining a set of diversity requirements, with defining comprising establishing a plurality of travel requirement templates, and for each travel requirement template, defining a plurality of travel requirements, each of the plurality of travel requirements corresponding to a different value of the respective travel requirements. This feature is similar to the corresponding feature of claim 1 and is supported for analogous reasons as those given in claim 1.

Claim 52 also includes the feature that for each travel requirement in the set of diversity requirements, selecting from the candidate set of travel options a travel option that satisfies that travel requirement. This feature is similar to the corresponding feature of claim 1 and is supported for analogous reasons as those given in claim 1.

Claim 52 also includes the feature of combining the selected travel options for the travel requirements to generate the diverse set of travel options. "With the pricing-graph the process for finding 370 the best travel option that satisfies a travel requirement is implemented for a representation that expresses travel options in terms of permitted combinations of smaller travel option components by disabling option components inconsistent with the requirement." [Specification page 41, line 30 to page 42, line 2].

Claim 52 also includes the feature of displaying the diverse set of travel options to a user. "Under control of the client process 36, the requesting client 30c can store and/or logically manipulate the set of pricing solutions 38 to extract or display a subset of the set of pricing solutions as a display representation 41 on the monitor 40." [Specification page 5, lines 18 to 23] "These travel options are displayed 356 to provide a trave[l]er a desirable option even if the trave[l]er has restrictions on the times the trave[l]er can travel, or preferences for one airline over another." [Specification page 40, lines 11 to 14]

Claim 56

Another aspect of the invention is covered by claim 56. Claim 56 is directed to an article of manufacture having computer-readable program portions embodied therein for generating a diverse set of travel options. "Referring now to FIG. 2, the server process 18 is preferably executed on the server computer 12 but could be executed on the client computer 32." [Specification page 5, lines 24 to 26].

The inventive features of claim 56 find support as the analogous features in claim 52.

(vi.) Grounds of Rejection to be Reviewed on Appeal

(1) Claims 1-4, 6-8, 27-28, 54 and 56-58 stand rejected under 35 U.S.C. 103(a) as being unpatentable over deMarcken et al. (U.S. Pat. No. 6,295,521) in view of Karch et al. (U.S. Pat. No. 6,442,537).

(2) Claims 55 and 59 are rejected under 35 U.S.C. 103(a) as being unpatentable over deMarcken et al. (U.S. Pat. No. 6,295,521) and Karch et al. (U.S. Pat. No. 6,442,537), in further view of Iyengar et al. (U.S. Pat. No. 6,360,205).

(vii.) Argument

Obviousness

"It is well established that the burden is on the PTO to establish a prima facie showing of obviousness, *In re Fritsch*, 972 F.2d. 1260, 23 U.S.P.Q.2d 1780 (C.C.P.A., 1972)."

"It is well established that there must be some logical reason apparent from the evidence or record to justify combination or modification of references. *In re Regal*, 526 F.2d 1399 188, U.S.P.Q.2d 136 (C.C.P.A. 1975). In addition, even if all of the elements of claims are disclosed in various prior art references, the claimed invention taken as a whole cannot be said to be obvious without some reason given in the prior art why one of ordinary skill in the art would have been prompted to combine the teachings of the references to arrive at the claimed invention. *Id.* Even if the cited references show the various elements suggested by the Examiner in order to support a conclusion that it would have been obvious to combine the cited references, the references must either expressly or impliedly suggest the claimed combination or the Examiner must present a convincing line of reasoning as to why one skilled in the art would have found the claimed invention obvious in light of the teachings of the references. *Ex Parte Clapp*, 227 U.S.P.Q.2d 972, 973 (Board. Pat. App. & Inf. 985)."

"The mere fact that the prior art could be so modified would not have made the modification obvious unless the prior art suggested the desirability of the modification." *In re Gordon*, 221 U.S.P.Q. 1125, 1127 (Fed. Cir. 1984).

Although the Commissioner suggests that [the structure in the primary prior art reference] could readily be modified to form the [claimed] structure, "[t]he mere fact that the prior art could be so modified would not have made the modification obvious unless the prior art suggested the desirability of the modification." *In re Laskowski*, 10 U.S.P.Q. 2d 1397, 1398 (Fed. Cir. 1989).

"The claimed invention must be considered as a whole, and the question is whether there is something in the prior art as a whole to suggest the desirability, and thus the obviousness, of making the combination." *Lindemann Maschinenfabrik GMBH v. American Hoist & Derrick*, 221 U.S.P.Q. 481, 488 (Fed. Cir. 1984).

Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination. Under Section 103, teachings of references can be combined only if there is some suggestion or incentive to do so. *ACS Hospital Systems, Inc. v. Montefiore Hospital*, 221 U.S.P.Q. 929, 933 (Fed. Cir. 1984) (emphasis in original, footnotes omitted).

"The critical inquiry is whether 'there is something in the prior art as a whole to suggest the desirability, and thus the obviousness, of making the combination.'" *Fromson v. Advance Offset Plate, Inc.*, 225 U.S.P.Q. 26, 31 (Fed. Cir. 1985).

(1) Claims 1-4, 6-8, 27-28, 54 and 56-58 are allowable over deMarcken et al. (U.S. Pat. No. 6,295,521) in view of Karch et al. (U.S. Pat. No. 6,442,537).

Claims 1-3, 7 and 8, 27-28

For the purposes of this appeal only, claims 1-3, 7 and 8, 27-28 may be treated as standing or falling together. Claim 1 is representative of claims 1-3, 7 and 8, 27-28.

Claim 1 recites a travel planning system including a requirements generator module to generate a set of diverse travel requirements, by establishing a plurality of travel requirement templates, and for each travel requirement template, defining a plurality of travel requirements corresponding to different values of the travel requirements. Claim 1 also calls for a selection module to output a set of diverse travel options *** and for each diverse travel requirement in the set of diverse travel requirements, selecting from the candidate set of travel options one or more travel options that satisfy that travel requirement ***.

The Examiner's characterization of what deMarcken combined with Karch teaches is incorrect. The examiner contends that deMarcken et al. discloses "a requirements generator module to generate a set of diverse travel requirements by establishing a plurality of travel requirement rule for each travel requirement (col. 50, lines 11-20)." This is incorrect.

deMarcken et al. describes at (Col. 50, lines 11-20):

For the set of pricing solutions represented by the pricing graph 38' to be useful, processes are provided to extract pricing solutions from the graph and manipulate the set of pricing solutions, as depicted in FIG. 19. In general, each of the enumeration processes to be described operate on the pricing graph to extract pricing solutions from the pricing graph according to particular criteria that can be set, for example, by a client system 30c (FIG. 2) in response to a user query 48 (FIG. 4). Examples of user queries as well as a display representation for information extracted from the pricing graph will be described below.

deMarcken does not describe in the above quoted passage or elsewhere, any of the recited features of the requirements generator. Rather, in above passage deMarcken et al. discusses a tool to extract or enumerate pricing solutions (e.g., travel options) from a compact representation of the travel options, (e.g., the pricing graph). While deMarcken indeed describes the pricing graph representation of travel options, which is included in claim 1, deMarcken does not disclose or suggest the concept of diverse travel options nor the requirements generator to generate a set of diverse travel requirements.

The examiner also contends that deMarcken et al. discloses: "and for each travel requirement rule, defining a plurality of travel requirements corresponding to different values of travel requirements (col. 51, lines 20-43; col. 60, lines 56-col. 61, line 65)." [Office Action pages 2-3] Claim 1 does not call for a rule, but calls for "travel requirement template."

What deMarcken et al. actually describes at (col. 51, lines 20-43; col. 60, lines 56-col. 61, line 65) is reproduced below:

The algorithm proceeds as follows: first, the nodes in the graph are ordered by depth and placed in a list, so that iterating over the list ensures that a child node is always encountered before its parent(s). Then, iterating across the list, the best value of F is computed for each node, using the already-computed values of F for its children. At this point every node in the graph is marked with its inner-value. The inner-value of a node is the best possible value of the function F on the set of (partial) pricing-solutions represented by the node. As inner-values are computed, for every OR node the child with the lowest inner-value is computed and stored. Finally, the best pricing solution can be constructed by starting at the root of the graph and collecting children. Whenever an OR node is encountered, the best child is chosen (the child with the lowest inner-value).

Neither in this passage nor elsewhere does deMarcken et al. disclose defining a plurality of travel requirements corresponding to different values of travel requirements for each travel requirement template. This passage in deMarcken et al. discusses the operation of the value

function when a user desires to extract with an enumeration function "pricing solutions" (travel options) with a certain value, e.g., lowest cost, etc.

The examiner admits that deMarcken fails to disclose templates, as in claim 1 and instead relies on Karch. The examiner states:

DeMarcken teaches the use of travel requirements rules (DeMarcken; col. 3, line 55-col. 4, line 62) but fails to expressly teach defining a template of rules. However, this feature is old and well known in the art, as evidenced by Karch's teachings wherein the rules are based at least in part on templates (Karch: col. 1, line 66-col. 2, line 6). At the time of the Applicant's invention it would have been obvious to one of ordinary skill in art to modify the system of DeMarcken with the teaching of Karch to include the feature of generating rule templates (e.g. for travel requirements). As suggested by Karch, one would have been motivated to include this feature to provide an efficient rules system that can learn and manipulate information, but does not result in significant degradation of performance through the use of extensive amounts processing power (Karch; col. 1, lines 38-42).

Karch does not provide any of the missing teachings in deMarcken, since Karch also fails to suggest the concept of diverse travel options. Moreover, the examiner has not provided a proper motivation to combine the teachings of deMarcken and Karch. The examiner fails to show where the initial teaching of generating rules for travel requirements exists in deMarcken. The examiner proffers a motivation to combine deMarcken with Karch as: "As suggested by Karch, one would have been motivated to include this feature to provide an efficient rules system that can learn and manipulate information, ***." The examiner has not set forth a convincing line of reasoning, nor do the references show to what purpose Karch would be put to in order to modify deMarcken.

deMarcken does not disclose defining a plurality of travel requirements corresponding to different values of the travel requirements. In the passage at col. 51, lines 20-43, which is relied up by the examiner to teach this feature in deMarcken, deMarcken discusses operation of a value function used in the pricing graph processing to compute a best value for each node in the pricing graph. However, nodes in the pricing graph are not travel requirements, rather the nodes are elements of the travel options, e.g., fares and flights. An enumeration process collects these nodes and enumerates the pricing solutions (travel options). deMarcken fails to teach using a set of preference functions provided according to a diversity process.

The examiner also relies on Col. 60 line 56 to Col. 61 line 65, of deMarcken, which describes:

The pricing graph can be viewed in other ways through the activation of the pull down menus shown in any of FIGS. 22, 24 and 26. For example, as shown in FIG. 22, there are four pull down menus "refresh", "outbound display", "return display" and "search properties." The refresh display will permit storing queries and permit a user to refresh the display. The outbound display menu will permit the user to resort the data according to any one of a number of characteristics. Example characteristics include, but are not necessarily limited to, cost, duration, departure time, arrival time, number of legs, number of segments and so forth. The outbound display can also be adjusted to allow a user to change the horizontal axis to a time or duration axis as well as change the itinerary size to have it displayed small or large. A similar arrangement is provided for the return display. The search properties allow a user to conduct a faring search by computing fares or not computing fares, that is, by providing complete pricing solutions or merely just activating the schedule portion of the server process 18. The search properties also permit the user to search by legs or segments, specify a search time, a number of itineraries and number of extra itineraries to discard.

Each of the display options referred to above make use of one or more of the value functions and processes described in conjunction with FIG. 19 and permitting the client process to extract or manipulate the pricing graph 38'. Accordingly, the pull down menus as well as the other controls on the graphical user interface are the user interface to the "value" functions and enumeration processes described above.

Referring now to FIG. 27, a window 500 is shown. The window 500 includes an ensemble of travel options depicted as a histogram 502. The histogram 502 is a plot of an metric or option such as time as the x axis versus the number of itineraries on the y axis. Portions of the histogram representation can be selected and the processes above will invalidate all travel node that are not selected. These will provide corresponding changes in a bar graph representation 504 disposed below the histogram 502. This will also affect a list airports 506 by possible changing a visual appearance of icons in the list 506.

OTHER EMBODIMENTS

It is to be understood that while the invention has been described in conjunction with the detailed description thereof, the foregoing description is intended to illustrate and not limit the scope of the invention, which is defined by the scope of the appended claims. Other aspects, advantages, and modifications are within the scope of the following claims.

What is claimed is:

1. A travel planning system comprising:
 - a server process that determines travel planning information in response to a travel request query;
 - a client process, to send the travel request query and that receives the travel planning information, said client process comprising:
 - a manipulation process that operates on the travel planning information, to extract, in response to a subsequent user command, travel options from the travel planning information sent from the server process.
2. The system of claim 1 wherein the server process and the client process execute on the same computer.
3. The system of claim 1 wherein said manipulation process of said client process operates on the travel planning information in accordance with at least one user command, and further comprises
 - a process that produces a set of travel planning information by fare in accordance with the at least one user command.
4. The system of claim 3 wherein said process client further comprises:

a process that sorts said travel planning information by lowest price based on the user input command.

5. The system of claim 1 wherein said manipulation process further comprises:

a process that finds for the set of pricing solutions a pricing solution that optimizes a value function.

Appellant fails to understand how the above passages support the examiner's reasoning, since, while the passages arguable deal with selecting travel options, since the travel options are displayed to a user, the passages utterly fails to suggest much less disclose "a selection module to output a set of diverse travel options ***."

Claim 4

Claim 4 recites a travel option generator module to generate a first ordered set of travel options using a first preference function and a second ordered set of travel options using a second preference function and wherein the selection module outputs a set of diverse travel options by selecting a first and second number of travel options from each of the first and second ordered set of travel options, respectively.

The examiner contends:

As per claim 4, DeMarcken1521 teaches a travel planning system further comprising:

- a travel option generator module to generate a first ordered set of travel options using a first preference function and a second ordered set of travel options using a second preference function, and (col. 5, line 26-col. 6, line 6)

- wherein the selection module to output a set of diverse travel options by selecting a first and second number of travel options from each of the first and second ordered set of travel options. (col. 4, lines 43-col. 5, line 25; col. 49, line 30-col. 50, line 39; Figure 3)

At col. 5, line 26-col. 6, line 6 deMarcken discusses manipulation of the pricing graph representation. deMarcken does not discuss a travel option generator module to generate a first ordered set of travel options using a first preference function and a second ordered set of travel options using a second preference function. While deMarcken does teach that: "In response to user input 76, the client 40 can manipulate 74 travel options and can query the local copy of the DAG to produce and display a subset of pricing solutions enumerated from the DAG that satisfy the query 76." [deMarcken Col. 6 lines], manipulation does not teach the claimed feature. Here

deMarcken teaches how pricing solutions are enumerated from the directed acyclic graph.

Nowhere however, is it suggested that the enumerated pricing solutions are ordered according to first and second preference functions and that a selection module operates on the ordered sets to produce a diverse set of travel options.

Some of the missing teachings in deMarcken in addition to the concept of diverse travel options include the teachings of:

The alternative diversity process 400 generates the best one or more travel options as defined by each of a set of different travel preference functions. The alternative diversity process 400 defines a set of travel preference functions with each function capable to order travel options. [Appellant's specification page 44 lines 3-8]

Given set of travel options Ts 401, a set of preference functions Fs, and a desired number of answers for each preference function Ns, the alternative diversity process 400 returns a reduced set of diverse travel options Rts. [Appellant's specification page 44 lines 15-18]

deMarcken does not suggest to operate on the pricing graph to provide a first ordered set of travel options using a first preference function and a second ordered set of travel options using a second preference function. Karch does not provide any of the missing teachings in deMarcken.

Accordingly, not only does deMarcken fail to teach the concept of a diversity process, as with Karch, deMarcken taken with Karch also fails to use first and second preference functions on the pricing graph to enumerate diverse options.

Claim 6

Claim 6 includes the feature that at least one of the diverse travel requirements within the plurality is not a user entered travel requirement.

The examiner contends that "DeMarcken '521 teaches the travel planning system of claim 1 wherein at least one of the travel requirements within the plurality is not a user entered travel requirement at (col. 4, lines 1-14). While, Appellant agrees that deMarcken at (col. 4, lines 1-14) teaches something that is not user defined, e.g., the industry defined databases of travel information; in the context of claim 6, this teaching is irrelevant. The industry defined

databases are not travel requirements, as defined in Appellant's claim 1. Again, as above, Karch does not provide any of the missing teachings in deMarcken.

Claims 52, 54, 56 and 58

For the purposes of this appeal only, claims 52, 54, 56 and 58 may be treated as standing or falling together. Claim 52 is representative of this group.

Claim 52 is directed to a method for generating a diverse set of travel options. Claim 52 includes the feature of determining a candidate set of travel options *** based on user input and represented using a data structure that compactly stores the candidate set of travel options. deMarcken clearly teaches representing travel options in a data structure that compactly stores travel options. As used in claim 52, whether the set can be characterized as a candidate set is arguable, since deMarcken contemplates enumeration of any possible travel option based on user manipulation, but neither appreciates nor addresses the concept of enumerating diverse travel options. What deMarcken thus fails to show are the features of defining a set of diversity requirements by establishing a plurality of travel requirement templates *** defining a plurality of travel requirements, each *** corresponding to a different value of the respective travel requirements, as generally argued for claim 1. deMarcken taken with Karch also fails to show for each travel requirement in the set of diversity requirements, selecting from the candidate set of travel options a travel option that satisfies that travel requirement and combining the selected travel options for the travel requirements to generate the diverse set of travel options ***.

It would not be apparent to one of ordinary skill in the art to modify deMarcken with Karch, since no motivation exist in either deMarcken, Karch or the prior art to provide these features, as generally argued in claim 1.

Claims 53, 57

For the purposes of this appeal only, claims 53 and 57 may be treated as standing or falling together. Claim 53 is representative of this group.

Claim 53 further limits claim 52 by reciting that the values for a particular travel requirement template are based on the candidate set of travel options. Clearly, deMarcken taken with Karch does not teach this feature, since deMarcken teachings to enumerate based on user input and Karch provides no relevant teachings to suggest this feature.

**(2) Claims 55 and 59 are allowable over
deMarcken et al. (U.S. Pat. No. 6,295,521) and
Karch et al. (U.S. Pat. No. 6,442,537), in further
view of Iyengar et al. (U.S. Pat. No. 6,360,205)**

Claims 54 and 59

For the purposes of this appeal only, claims 54 and 59 may be treated as standing or falling together. Claim 55 is representative of this group.

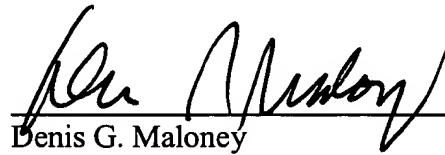
Claim 55, which depends from claim 54, recites that the values for the travel requirement template of particular carriers include a first particular airline and a second, different particular airline. While Iyengar does show interfaces with plural carriers, that teaching is irrelevant to claim 55 since Iyengar's teachings of multiple carriers is part of the user selectable query space, not values for the travel requirement template, as claimed by Appellant.

Conclusion

Appellant submits, therefore, that Claims 1-4, 6-8, 27-28 and 52-59 are allowable over the cited art. Therefore, the Examiner erred in rejecting Appellant's claims and should be reversed.

Respectfully submitted,

Date: 9/14/01



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Appendix of Claims

1. A travel planning system comprising:

a requirements generator module to generate a set of diverse travel requirements, by establishing a plurality of travel requirement templates, and for each travel requirement template, defining a plurality of travel requirements corresponding to different values of the travel requirements; and

a selection module to output a set of diverse travel options, the number of travel options in the set of diverse travel options being fewer in number than the number of travel options in a candidate set of travel options and for each diverse travel requirement in the set of diverse travel requirements, selecting from the candidate set of travel options one or more travel options that satisfy that travel requirement with the candidate set of travel options represented using a data structure that compactly stores the candidate set of travel options.

2. The travel planning system of claim 1 wherein the data structure comprises a graph data structure.

3. The travel planning system of claim 1 further comprising a display to display the diverse set of travel options.

4. The travel planning system of claim 1 further comprising:

a travel option generator module to generate a first ordered set of travel options using a first preference function and a second ordered set of travel options using a second preference function, and

wherein the selection module outputs a set of diverse travel options by selecting a first and second number of travel options from each of the first and second ordered set of travel options, respectively.

Claim 5 is canceled.

6. The travel planning system of claim 1 wherein at least one of the diverse travel requirements within the plurality is not a user entered travel requirement.

7. The travel planning system of claim 1 wherein the plurality of diverse travel requirements comprise at least one of travel on a particular carrier, non-stop travel, outbound travel departing in a predefined time period, return travel departing in a predefined time period, non-stop travel on a predefined airline, or travel with an outbound departure on a first predefined date and a return arrival on a second predefined date.

8. The travel planning system of claim 7 wherein the predefined time period comprises morning, afternoon, evening or a predefined date.

Claims 9-26 are cancelled.

27. The travel planning system of claim 1 wherein the compact data structure comprises a directed acyclic graph.

28. The travel planning system of claim 1 wherein the compact data structure comprises a grammar.

Claims 29-51 are cancelled.

52. A method for generating a diverse set of travel options, the method comprising:
determining a candidate set of travel options, the candidate set of travel options being based on user input and represented using a data structure that compactly stores the candidate set of travel options;

defining a set of diversity requirements, with defining comprising:

establishing a plurality of travel requirement templates, and for each travel requirement template, defining a plurality of travel requirements, each of the plurality of travel requirements corresponding to a different value of the respective travel requirements, and

for each travel requirement in the set of diversity requirements, selecting from the candidate set of travel options a travel option that satisfies that travel requirement;
combining the selected travel options for the travel requirements to generate the diverse set of travel options; and
displaying the diverse set of travel options to a user.

53. The method of claim 52 wherein values for a particular travel requirement template are based on the candidate set of travel options.

54. The method of claim 52 wherein the plurality of travel requirement templates include particular carriers, number of stops, outbound travel departing in a predefined time period, return travel departing in a predefined time period, or travel with an outbound departure on a first predefined date and a return arrival on a second predefined date.

55. The method of claim 54 wherein values for the travel requirement template of particular carriers include a first particular airline and a second, different particular airline.

56. An article of manufacture having computer-readable program portions embodied therein for generating a diverse set of travel options, the article comprising instructions for causing a processor to:

determine a candidate set of travel options, the candidate set of travel options being based on user input and represented using a data structure that compactly stores the candidate set of travel options;

define a set of diversity requirements with instructions to define comprising instructions to:

establish a plurality of travel requirement templates, and for each travel requirement template,

define a plurality of travel requirements, each of the plurality of travel requirements corresponding to a different value of the respective travel requirements, and

for each travel requirement in the set of diversity requirements,

select from the candidate set of travel options a travel option that satisfies that travel requirement;

combine the selected travel options for the travel requirements to generate the diverse set of travel options; and

display the diverse set of travel options to a user.

57. The article of claim 56 wherein values for a particular travel requirement template are based on the candidate set of travel options.

58. The article of claim 56 wherein the plurality of travel requirement templates include templates for particular carriers, number of stops, outbound travel departing in a predefined time period, return travel departing in a predefined time period, or travel with an outbound departure on a first predefined date and a return arrival on a second predefined date.

59. The article of claim 58 wherein values for the travel requirement template of particular carriers with corresponding travel requirements include a first particular airline and a second, different particular airline.

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Serial No. : 09/431,365
Filed : November 1, 1999
Page : 20 of 20

Attorney's Docket No.: 09765-021001

Evidence Appendix

None

Related Proceedings Appendix

None